

EMFAC2002



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THE LATEST UPDATE TO THE ON-ROAD EMISSIONS INVENTORY

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The chart to the right displays the overall change in the summertime on-road emission inventory, contrasting EMFAC2002 and EMFAC2001 (version 2.08). The figures are expressed in tons per day for calendar year 2010.

Overall, the changes to the inventory result in a reduction of 35 tons per day (tpd) of exhaust emissions of reactive organic gases (ROG) and a 43 tpd reduction in evaporative emissions of ROG. Carbon monoxide (CO) is reduced by 560 tpd and particulate matter (PM) is reduced by 6 tpd. The estimate of oxides of nitrogen (NOx) increases by 78 tpd.

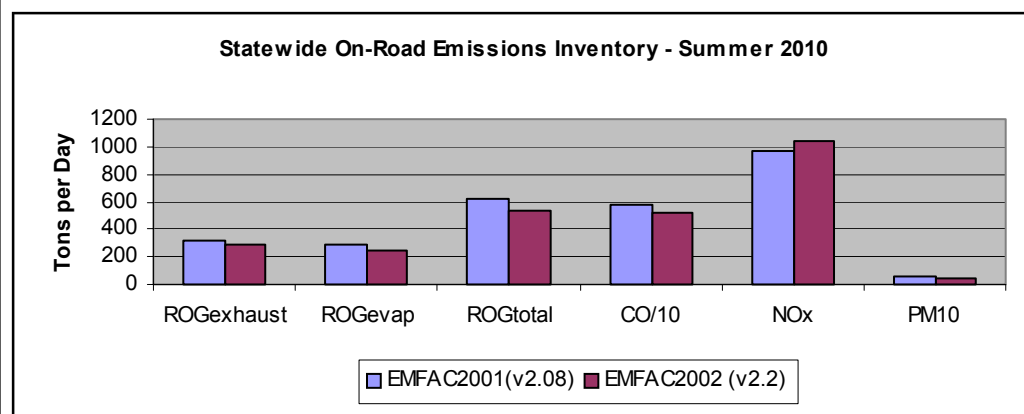
The Air Resources Board (ARB) is releasing its latest on-road motor vehicle emissions model, called EMFAC2002, for use in California. Past, current and future year emissions from vehicles can be estimated based on the emission rates in the model, the impacts of adopted controls, and travel activity levels. These projections are used to support air pollutant inventories, development of regulations and air quality plans to reduce pollution, and analysis of transportation program impacts.

The EMFAC2002 model includes two basic modules: emission factors and vehicle activity. Emission factors describe the emissions characteristics of vehicles under different ambient and driving conditions. We develop these factors based on thousands of emissions tests on both new and used vehicles recruited randomly from the California fleet. Emission factors are held constant in the model.

Within the EMFAC model, these factors are combined with vehicle activity, or estimates of travel and vehicle demographics, for each county, local air district, and air basin in California. EMFAC2002 relies on data provided by regional transportation agencies, as well as Department of Motor Vehicles (DMV) vehicle registration data, for this vehicle activity information. EMFAC2002 also includes the latest information available from the DMV as of October 2001 on the types and ages of vehicles in the fleet for each county.

The regional transportation agencies provide both total vehicle miles of travel (VMT) and the distribution of VMT by speed for the motor vehicle emissions inventory used in the State Implementation Plan (SIP) and transportation conformity analyses. These data are incorporated into EMFAC2002 as defaults and, as necessary, can be easily updated using the model's What If Scenario (WIS) generator tool. Though the regional agencies also calculate motor vehicle trips, EMFAC2002 defines trips as vehicle starts and calculates them separately as a function of vehicle population (derived from vehicle registration data), based on ARB and U.S. EPA instrumented vehicle studies.

EMFAC2002 emission factors are subject to review and approval by the United States Environmental Protection Agency prior to use in the transportation conformity process. Transportation activity estimates, including the defaults in EMFAC, can be revised by the model user and are not subject to federal review except as part of specific SIP revisions and conformity analyses.



INCREMENTAL INVENTORY ADJUSTMENTS (2010 SUMMER)

Each change to the inventory reflected in EMFAC2002 has differing effects by geographical area.

The tables presented on this, and the following page illustrate these incremental differences.

Details of each change are discussed separately in this document and presented in depth in our technical memoranda.

Statewide (Tons per Day)	ROG total	CO	NOx	PM total
EMFAC 2001 Baseline	616	5756	965	56.6
Revised Evaporative Emissions Schedule	0	0	0	0
Correction to 2007+ PM Emission Rates	0	0	0	-1.5
Passenger Car Accrual Rates	-14	-211	-16	-0.1
Revisions to I/M Assumptions	+1	+11	+2	0
Updated Activity (Speed Distribution)	-4	-32	+23	-1.0
Updated Activity (Vehicle Miles Traveled)	+8	+68	+12	+0.8
Tire and Brake Wear Emissions	0	0	0	-5.7
School Bus Activity	+1	+12	+11	+0.5
Extended Idle (Heavy Diesel and School Bus)	+2	+9	+26	+0.5
Monthly Average Fuel RVP & RFGIII	0	0	0	0
Revisions to Population and Age	-71	-416	+21	+0.4
New Baseline—EMFAC2002	539	5197	1044	50.5

South Coast Air Basin (Tons per Day)	ROG total	CO	NOx	PM total
EMFAC 2001 Baseline	222	2065	333	21.5
Revised Evaporative Emissions Schedule	0	0	0	0
Correction to 2007+ PM Emission Rates	0	0	0	0
Passenger Car Accrual Rates	-6	-84	-7	0
Revisions to I/M Assumptions	0	+6	+1	-1
Updated Activity (Speed Distribution)	-8	-79	+18	-1
Updated Activity (Vehicle Miles Traveled)	+2	+13	+2	0
Tire and Brake Wear Emissions	0	0	0	-2
School Bus Activity	0	+3	+3	0
Extended Idle (Heavy Diesel and School Bus)	+1	+3	+10	0
Monthly Average Fuel RVP & RFGIII	0	0	0	0
Revisions to Population and Age	-24	-129	+8	0
New Baseline—EMFAC2002	187	1,801	367	17.5

Some Error is Introduced Through Rounding

INCREMENTAL INVENTORY ADJUSTMENTS (2010 SUMMER)

Sacramento Valley Basin (Tons per Day)	ROG total	CO	NOx	PM total
EMFAC 2001 Baseline	50	439	74	4.2
Revised Evaporative Emissions Schedule	0	0	0	0
Correction to 2007+ PM Emission Rates	0	0	0	0
Passenger Car Accrual Rates	-1	-15	-1	0
Revisions to I/M Assumptions	0	+1	0	0
Updated Activity (Speed Distribution)	0	-2	0	0
Updated Activity (Vehicle Miles Traveled)	+1	+6	0	0
Tire and Brake Wear Emissions	0	0	0	0
School Bus Activity	0	+1	+1	0
Extended Idle (Heavy Diesel and School Bus)	0	+1	+2	0
Monthly Average Fuel RVP & RFGIII	0	0	0	0
Revisions to Population and Age	-8	-51	-1	0
New Baseline—EMFAC2002	42	380	75	4.2

San Joaquin Valley Basin (Tons per Day)	ROG total	CO	NOx	PM total
EMFAC 2001 Baseline	70	702	136	7.5
Revised Evaporative Emissions Schedule	0	0	0	0
Correction to 2007+ PM Emission Rates	0	0	0	0
Passenger Car Accrual Rates	-1	-16	-1	0
Revisions to I/M Assumptions	0	+1	0	0
Updated Activity (Speed Distribution)	-1	-7	0	0
Updated Activity (Vehicle Miles Traveled)	0	-15	-3	0
Tire and Brake Wear Emissions	0	0	0	-1
School Bus Activity	0	+2	+2	0
Extended Idle (Heavy Diesel and School Bus)	0	+2	+4	0
Monthly Average Fuel RVP & RFGIII	0	0	0	0
Revisions to Population and Age	-10	-78	-1	0
New Baseline—EMFAC2002	58	591	137	6.5

Some Error is Introduced Through Rounding

The regional differences in the incremental analysis are especially evident with respect to changes to fleet characteristics including population, VMT and speed distribution

STATEWIDE EMISSIONS INVENTORY SUMMER 2010(TPD)

REVISIONS TO EVAPORATIVE EMISSIONS

After the release of EMFAC 2000, the ARB adopted programs requiring further changes to the model including modifications to the Zero Emission Vehicle (ZEV) program and the adoption of some portions of the federal Tier II Program.

While these changes were incorporated into EMFAC 2001 for exhaust emissions, the corresponding updates were not made for evaporative emissions.

EMFAC2002 corrects this oversight and the implementation schedules have been revised to properly align the exhaust and evaporative emission rates.

Specifically, the modifications to the regulations result in a projected increase in the production and sale of Partial ZEVs (PZEV) passenger cars and light-duty trucks.

As these vehicles have virtually no evaporative emissions, this change to the inventory will result in a 0.1 ton per day, (0.02 percent), reduction in reactive organic gases statewide in the year 2010, increasing to a 10 ton per day reduction by the year 2030.

County	Vehicles	VMT(000)	ROG ex	ROG ev	ROG tot	CO	NOx	PM
Alameda	1233780	40723	13.01	10.46	23.47	216.41	48.53	2.23
Alpine	1783	55	0.03	0.03	0.06	0.51	0.08	0.00
Amador	49816	1712	0.81	0.77	1.58	13.73	2.47	0.09
Butte	186539	5762	2.50	2.59	5.09	42.43	6.90	0.31
Calaveras	66663	2016	0.96	1.04	2.00	15.95	2.16	0.09
Colusa	20007	751	0.29	0.23	0.52	4.65	1.44	0.05
Contra Costa	888805	29988	8.85	7.22	16.07	155.89	28.94	1.51
Del Norte	26805	829	0.48	0.35	0.83	7.52	1.20	0.04
El Dorado	175241	4667	1.56	2.08	3.64	27.73	4.30	0.21
Fresno	625146	24732	7.25	6.80	14.05	135.35	30.43	1.44
Glenn	28987	947	0.45	0.40	0.85	7.52	1.41	0.06
Humboldt	122861	3927	2.28	1.69	3.97	35.02	6.90	0.23
Imperial	141734	5490	3.70	2.68	6.38	60.29	11.21	0.39
Inyo	24645	778	0.49	0.36	0.85	7.53	1.34	0.04
Kern	577688	26833	7.84	5.16	13.00	142.33	35.09	1.60
Kings	84903	3885	1.37	0.83	2.20	24.32	5.62	0.23
Lake	75349	2236	1.43	1.20	2.63	22.83	3.08	0.11
Lassen	30422	931	0.71	0.50	1.21	10.75	1.74	0.06
Los Angeles	6097028	212424	61.27	56.27	117.54	1155.38	226.84	11.1
Madera	125867	5442	2.20	1.37	3.57	38.29	7.99	0.33
Marin	247338	7858	2.82	1.94	4.76	45.14	8.46	0.41
Mariposa	22713	691	0.39	0.40	0.79	6.39	0.83	0.04
Mendocino	100335	3198	1.73	1.38	3.11	27.23	5.07	0.18
Merced	178035	8365	2.76	1.69	4.45	52.31	10.11	0.47
Modoc	11278	352	0.42	0.24	0.66	5.88	1.02	0.03
Mono	15207	477	0.27	0.20	0.47	3.97	0.85	0.03
Monterey	308412	13237	5.22	2.24	7.46	83.89	19.17	0.80
Napa	127969	3887	1.56	1.28	2.84	24.56	4.66	0.22
Nevada	118825	3456	1.15	1.26	2.41	19.45	3.14	0.15

MODIFICATION TO 2007+ PM

In December of 2000, the U.S. EPA adopted regulations to reduce emissions from new diesel-powered heavy-duty engines. These regulations take effect in 2007 and apply to both California and federally certified medium-duty, and heavy-duty trucks. In order to reflect this change in EMFAC, staff modified the basic emission rates of heavy-heavy duty diesel vehicles. Although the modifications were properly made for HC, CO, and NOx, the change in particulate matter (PM) emission rates were not reflected. The emission factor was changed, from 0.02586 grams per mile at zero miles to .0026 grams per mile. This change results in a 1.5 ton per day reduction in PM statewide in 2010 and a 7 ton per day reduction statewide in the year 2020.

STATEWIDE EMISSIONS INVENTORY SUMMER 2010(TPD)

County	Vehicles	VMT(000)	ROG ex	ROG ev	ROG tot	CO	NOx	PM
Orange	2380860	74632	17.55	19.75	37.30	333.82	67.13	3.53
Placer	314608	10004	2.61	3.08	5.69	50.35	7.84	0.45
Plumas	26939	818	0.61	0.43	1.04	8.82	1.95	0.06
Riverside	1342410	55246	12.56	11.61	24.17	260.58	52.12	2.81
Sacramento	1009940	33091	8.85	10.34	19.19	167.42	34.92	1.72
San Benito	51194	1983	0.68	0.35	1.03	10.59	2.72	0.12
San Bernardino	1373522	51866	13.33	12.50	25.83	260.00	56.79	2.59
San Diego	2336490	87481	23.29	18.85	42.14	433.05	81.33	4.60
San Francisco	461954	13867	6.13	3.95	10.08	88.14	23.18	0.92
San Joaquin	473468	19318	4.67	4.03	8.70	89.42	20.39	1.06
San Luis Obispo	241827	7533	2.51	2.02	4.53	43.36	7.85	0.35
San Mateo	650656	25135	7.30	4.55	11.85	127.89	24.02	1.33
Santa Barbara	318266	10736	4.48	2.86	7.34	71.81	13.77	0.59
Santa Clara	1511280	52406	16.35	11.73	28.08	283.16	50.98	2.74
Santa Cruz	231317	6503	2.73	2.23	4.96	42.20	8.17	0.34
Shasta	174085	5504	2.17	2.20	4.37	37.94	5.81	0.29
Sierra	3789	122	0.10	0.06	0.16	1.32	0.24	0.01
Siskiyou	51080	1614	1.25	0.94	2.19	18.65	3.03	0.10
Solano	364455	11951	3.44	3.14	6.58	60.69	12.59	0.61
Sonoma	439168	14321	5.88	4.11	9.99	93.26	18.00	0.81
Stanislaus	380531	13392	3.87	3.87	7.74	70.25	15.84	0.76
Sutter	88435	2922	0.99	0.96	1.95	17.50	3.18	0.15
Tehama	51499	1658	0.67	0.67	1.34	11.90	1.85	0.09
Trinity	16530	459	0.52	0.40	0.92	7.62	0.91	0.03
Tulare	302386	11976	4.26	3.39	7.65	75.84	17.26	0.71
Tuolumne	66496	2010	1.03	1.04	2.07	16.54	2.48	0.10
Ventura	668435	17471	4.80	5.74	10.54	83.56	17.18	0.78
Yolo	153740	5813	1.42	1.29	2.71	24.53	8.45	0.35
Yuba	56341	1842	0.70	0.70	1.40	12.39	2.18	0.10
Statewide	27255900	957324	288.6	249.5	538.0	5195.9	1043.2	50.5

MODIFICATION TO MILEAGE ACCRUAL RATE ESTIMATES

The EMFAC model maintains an internal relationship between mileage accrual rates, vehicle population, and vehicle miles of travel (VMT). The VMT of a specific age and class of vehicles can be calculated as the product of the population and the corresponding mileage accrual rate.

In April of 2000, an adjustment was made to the mileage accrual rates of all passenger cars (gas, diesel and electric) to better match the overall statewide VMT estimate.

This adjustment made the accrual rates of passenger cars equal to that of light duty trucks. The change tended to overstate the travel of older passenger cars in some areas of the state.

In EMFAC2002, staff returned the accrual rates of passenger cars to the original levels reported in the EMFAC2000 technical support documentation.

This change results in a 14 tpd reduction in ROG, 211 tpd reduction in CO, 16 tpd reduction in NOx, and a 0.1 tpd reduction in exhaust particulate matter statewide in the year 2010.

REVISIONS TO I/M ASSUMPTIONS

EMFAC2001 assumed hypothetical pass/fail criteria or "cutpoints" for the Enhanced Inspection and Maintenance (I/M) program would be implemented beginning in 2010, based on analyses in the 1994 SIP. Consistent with other control assumptions in the model based on adopted regulations, we removed these cutpoints as the default in EMFAC2002. This modification results in a higher statewide inventory in 2010 of 0.7 tpd ROG, 10.6 tpd CO, and 2.2 tpd NOx. The benefits attributable to local air districts' decisions to opt expanded areas into the Enhanced program are not included in EMFAC2002 and must be generated "off-model" to estimate the full benefits of the Enhanced I/M program in place in California.

NEW SPEED DISTRIBUTIONS (ACTIVITY)

UPDATES TO SPEED DISTRIBUTIONS

Regional transportation agencies have the responsibility of providing vehicle activity estimates to the ARB. These agencies forecast changes to their network and the impacts that these changes might have on the total daily vehicle miles of travel (VMT) and the distribution of VMT by speed.

In general, as the VMT increases in a region, speeds tend to slow down due to congestion. In turn, emissions increase as vehicles must operate for a longer period of time to traverse the same distance. The opposite is true for higher estimates of speed.

EMFAC groups VMT by speed into thirteen speed bins ranging from 5 miles per hour to 65 miles per hour. These estimates of VMT by speed are paired with speed specific correction factors to reflect the unique emission characteristics of travel at different speeds.

The updated distributions provided by the transportation agencies suggest higher average speeds compared to previous submittals. This results in an overall reduction in ROG and CO and slight increases in NOx.

County	Agency	Air Basin	Calendar Years
Monterey	AMBAG	North Central Coast	2000, 2010, 2020, 2025
San Benito	AMBAG	North Central Coast	2000, 2010, 2020, 2025
Santa Cruz	AMBAG	North Central Coast	2000, 2010, 2020, 2025
Amador	ACCTC	Mountain Counties	2000, 2006, 2016
Alameda	MTC	San Francisco Bay	2000, 2005, 2010, 2020, 2025
Contra Costa	MTC	San Francisco Bay	2000, 2005, 2010, 2020, 2025
Marin	MTC	San Francisco Bay	2000, 2005, 2010, 2020, 2025
Napa	MTC	San Francisco Bay	2000, 2005, 2010, 2020, 2025
San Francisco	MTC	San Francisco Bay	2000, 2005, 2010, 2020, 2025
San Mateo	MTC	San Francisco Bay	2000, 2005, 2010, 2020, 2025
Santa Clara	MTC	San Francisco Bay	2000, 2005, 2010, 2020, 2025
Solano	MTC	San Francisco Bay	2000, 2005, 2010, 2020, 2025
Sonoma	MTC	San Francisco Bay	2000, 2005, 2010, 2020, 2025
Solano	MTC	Sacramento Valley	2000, 2005, 2010, 2020, 2025
Sonoma	MTC	North Central Coast	2000, 2005, 2010, 2020, 2025
Placer	SACOG	Sacramento Valley	2000, 2002, 2005, 2015, 2025
Sacramento	SACOG	Sacramento Valley	2000, 2002, 2005, 2015, 2025
Sutter	SACOG	Sacramento Valley	2000, 2002, 2005, 2015, 2025
Yolo	SACOG	Sacramento Valley	2000, 2002, 2005, 2015, 2025
El Dorado	SACOG	Mountain Counties	2000, 2002, 2005, 2015, 2025
Placer	SACOG	Mountain Counties	2000, 2002, 2005, 2015, 2025
San Diego	SANDAG	San Diego	2000, 2005, 2010, 2020, 2025
Santa Barbara	SBCAG	South Central Coast	1999, 2005, 2010, 2015, 2020
Los Angeles	SCAG	South Coast	2000, 2006, 2010, 2020, 2025, 2030
Orange	SCAG	South Coast	2000, 2006, 2010, 2020, 2025, 2030
Riverside	SCAG	South Coast	2000, 2006, 2010, 2020, 2025, 2030
San Bernardino	SCAG	South Coast	2000, 2006, 2010, 2020, 2025, 2030
Ventura	SCAG	South Central Coast	2000, 2006, 2010, 2020, 2025, 2030
Riverside	SCAG	Salton Sea	2000, 2006, 2010, 2020, 2025, 2030
Los Angeles	SCAG	Mojave Desert	2000, 2006, 2010, 2020, 2025, 2030
Riverside	SCAG	Mojave Desert	2000, 2006, 2010, 2020, 2025, 2030
San Bernardino	SCAG	Mojave Desert	2000, 2006, 2010, 2020, 2025, 2030
Fresno	COFCG	San Joaquin	1998, 2002, 2005, 2015, 2020, 2025
Kern	KCOG	San Joaquin	1998, 2005, 2015, 2025
Kings	KCAG	San Joaquin	1998, 2002, 2005, 2015, 2020, 2025
Madera	MAG	San Joaquin	2000, 2002, 2005, 2015, 2025
Merced	MCOG	San Joaquin Valley	2000, 2002, 2005, 2015, 2020, 2025
San Joaquin	SJCOG	San Joaquin Valley	1999, 2002, 2005, 2015, 2025
Stanislaus	STANCOG	San Joaquin Valley	1999, 2002, 2005, 2006, 2015, 2020, 2025
Tulare	TCAG	San Joaquin Valley	1999, 2005, 2015, 2025

NEW VMT FORECASTS (ACTIVITY)

UPDATING ESTIMATES OF VEHICLE MILES TRAVELED

EMFAC2002 contains the latest vehicle miles of travel (VMT) information available from regional transportation agencies.

New forecasts were received from the Association of Monterey Bay Area Governments (AMBAG), the Bay Area Metropolitan Transportation Commission (MTC), San Joaquin Council of Governments (SJCOG), the Sacramento Area Council of Governments (SACOG), the Kern Council of Governments (KCOG), the Madera Association of Governments (MAG), the Merced Council of Governments (MCOG), and the Southern California Association of Governments (SCAG).

In general, the VMT forecasts are higher compared to previous submissions.

In 2005, these new forecasts increase the statewide VMT by 975,000 miles per day. A higher VMT forecast indirectly results in an increase in the estimate of vehicle population growth.

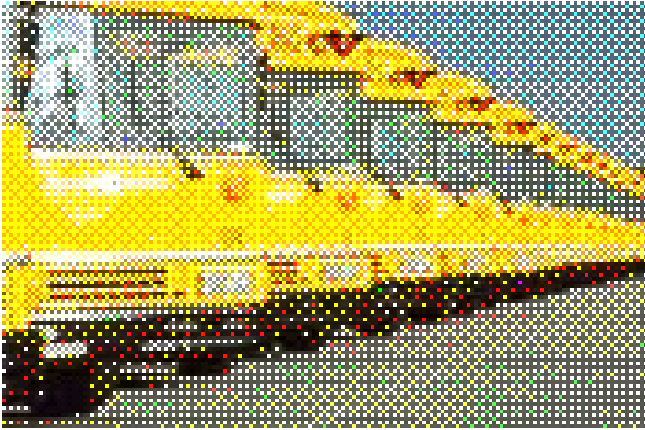
In the aggregate, the modifications to the VMT and vehicle population estimates result in increases in ROG of 1.4 tons per day, CO of 32 tons per day, and NOx of 6.5 tons per day in 2005.

County	Agency	Air Basin	Calendar Years
Alameda	MTC	San Francisco Bay Area	2000, 2005, 2010, 2020, 2025
Contra Costa	MTC	San Francisco Bay Area	2000, 2005, 2010, 2020, 2025
Marin	MTC	San Francisco Bay Area	2000, 2005, 2010, 2020, 2025
Napa	MTC	San Francisco Bay Area	2000, 2005, 2010, 2020, 2025
San Francisco	MTC	San Francisco Bay Area	2000, 2005, 2010, 2020, 2025
San Mateo	MTC	San Francisco Bay Area	2000, 2005, 2010, 2020, 2025
Santa Clara	MTC	San Francisco Bay Area	2000, 2005, 2010, 2020, 2025
Solano	MTC	Sacramento Valley	2000, 2005, 2010, 2020, 2025
Sonoma	MTC	North Coast	2000, 2005, 2010, 2020, 2025
Monterey	AMBAG	North Central Coast	2000, 2010, 2020, 2025
San Benito	AMBAG	North Central Coast	2000, 2010, 2020, 2025
Santa Cruz	AMBAG	North Central Coast	2000, 2010, 2020, 2025
Kern (SJV)	KCOG	San Joaquin Valley	1998, 2005, 2015, 2025
Madera	MAG	San Joaquin Valley	2000, 2005, 2010, 2020, 2025
Merced	MCOG	San Joaquin Valley	2000, 2005, 2010, 2020, 2025
San Joaquin	SJCOG	San Joaquin Valley	1999, 2005, 2015, 2025
Kern (MD)	KCOG	Mojave Desert	1998, 2005, 2015, 2025
Sacramento	SACOG	Sacramento Valley	2000, 2002, 2005, 2015, 2025
Yolo	SACOG	Sacramento Valley	2000, 2002, 2005, 2015, 2025
Placer	SACOG	Mountain Counties	2000, 2002, 2005, 2015, 2025
Placer	SACOG	Sacramento Valley	2000, 2002, 2005, 2015, 2025
El Dorado	SACOG	Mountain Counties	2000, 2002, 2005, 2015, 2025
Los Angeles	SCAG	South Coast	2000,2006,2010,2020,2025,2030
Orange	SCAG	South Coast	2000,2006,2010,2020,2025,2030
Riverside	SCAG	South Coast	2000,2006,2010,2020,2025,2030
San Bernardino	SCAG	South Coast	2000,2006,2010,2020,2025,2030
Ventura	SCAG	South Central Coast	2000,2006,2010,2020,2025,2030
Los Angeles	SCAG	Mojave Desert	2000,2006,2010,2020,2025,2030
San Bernardino	SCAG	Mojave Desert	2000,2006,2010,2020,2025,2030
Riverside	SCAG	Salton Sea	2000,2006,2010,2020,2025,2030

CORRECTIONS TO ESTIMATES OF TIRE AND BRAKE WEAR

In EMFAC, the emission rates of passenger cars are "scaled up" to represent the emissions of light-duty and medium-duty trucks. The application of a "standards ratio" is used to reflect the differences in the exhaust emission standards for these classes of vehicles. The ratio for exhaust emissions of particulate matter (PM) were incorrectly applied to the tire and brake wear estimates for which no standard exists. Correcting this problem decreases the PM inventory attributable to gasoline powered light-duty and medium-duty trucks by 5.7 tons per day, statewide in the year 2010.

SCHOOL BUS ACTIVITY AND EMISSIONS



ACTIVITY CHANGES FOR SCHOOL BUSES

School buses were first added to the on-road emissions inventory as a separate vehicle class in EMFAC2000. At that time, the assumption was made that these vehicles experienced all of their travel during two time periods; between 6:00 and 9:00 am, and 3:00 pm to 6:00 pm.

In a subsequent update, the vehicle miles of travel (VMT) and the speed distributions (the percentage of the VMT driven at each speed), were not properly allocated to these time periods. As a consequence, emissions were not calculated for activity assumed to occur from 6:00 pm to 6:00 am and from 9:00 am to 3:00 pm. Correcting this problem results in an increase of 1.0, 10.9 and 0.5 tons per day of ROG, NOx and PM, respectively, statewide in the year 2010.

SCHOOL BUS IDLE

Idle emissions for heavy-duty vehicles were also introduced to the inventory in EMFAC2000; however, no estimates were made for school buses at that time. In a study performed for the ARB, school buses were followed along their normal routes and their activities recorded. These buses were observed to make an average of 5.75 stops per route and idle for approximately 1.38 minutes per stop. An additional sixteen minutes of idle was attributed to morning start up, inspection and other yard activities, resulting in an estimate of 32 minutes of idle per bus per day. The idle emission rates of medium-duty vehicles were used for school buses resulting in an overall increase of 0.2, 1.0, 1.1 and 0.02 tons per day for HC, CO, NOx and PM, respectively, statewide in 2002.

Significant Changes Were Made to the Idle Estimates for Heavy-Duty Diesels

EXTENDED IDLE FOR HEAVY-HEAVY DUTY DIESELS

When idle emission rates were introduced in EMFAC2000, only that activity associated with idle trips, defined as key on to key off events with no appreciable distance traveled, were included. This activity is indicative of a waiting in queue to pick up or drop off a shipment.

Extended idles, which are more representative of overnight layovers, were excluded.

Staff analyzed the second by second activity data collected over 2,500 trips taken by 84 instrumented heavy heavy-duty trucks to determine their average idle activity.

This study yielded an estimate of 105 minutes of idle per vehicle, which can be compared to the current estimate of about 13 minutes per vehicle per day.

Changing the idle time as described results in an increase of 1, 7, 22 and 0.6 tons per day of HC, CO, NOx and PM statewide in 2002.



CHANGES TO FUEL RELATED ESTIMATES

REVISIONS TO FUEL VOLATILITY ESTIMATES

Beginning in 1996, state regulations required that all gasoline sold in California meet low-volatility (less than 7.0 Reid Vapor Pressure) requirements during summer ozone months. The volatility levels are allowed to vary with regard to the start and end of the ozone season. Under the regulation, gasoline producers must begin producing and shipping compliant gasoline one month prior to the time at which all retail outlets must comply with the specification.

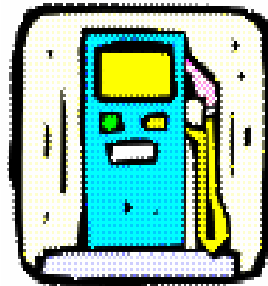
To reflect this regulation, EMFAC2002 has been revised with respect to the control periods for several areas of the state.

The method also changed how the RVP is determined in estimating "winter" CO episodic inventories.

In previous versions of the model, the maximum RVP values found during the winter months were used to calculate the inventory. In EMFAC2002, an average of the December, January and February monthly RVP values are used.

This change results in a 2.4 ton per day decrease in evaporative hydrocarbons in the annual average inventory, statewide in the year 2010.

Using the winter-average RVP instead of the maximum



value lowers the evaporative emissions in the winter episodic inventory by about 46 tons per day, statewide (12%) in the year 2010. This change has no effect on the summer episodic inventory.

*Corrections to
Monthly Average
RVP Estimates
And
Phase III Fuel
Implementation*

REVISED IMPLEMENTATION DATE FOR PHASE III FUEL

Phase III fuel, in which the additive MTBE is to be eliminated, was scheduled for mandatory introduction no later than December 31, 2002. A two percent reduction in NO_x and a 30 percent reduction in sulfur dioxide were estimated as the benefit of revising the fuel specification.

On March 14, 2002, Governor Davis issued an executive order (D-52-02) postponing for one year, the prohibitions of the use of MTBE and other specified oxygenates in California gasoline and the related requirements for Phase III fuel.

As a result, in EMFAC2002, the benefits associated with

the introduction of Phase III fuel were pushed back from 2003 to 2004.

This change results in a 10 ton per day higher emission inventory estimate for NO_x for 2003 only. The full benefits are assumed in EMFAC 2002 for calendar year 2004 and beyond.

THE "WIS" WHAT IF SCENARIO GENERATOR

Introduced in EMFAC2001 version 2.08, the what if scenario generation tool, the "WIS" is carried over to EMFAC2002.

The WIS allows users to vary a number of the model's default parameters without having to modify the code or recompile the model.

This flexibility allows for the development of detailed scenarios reflecting regional or micro-scale changes to the fleet or transportation network while maintaining consistency with the overall inventory estimation process.

The modifiable parameters include:

- Speed Distribution by Class**
- Overall VMT or VMT by Class**
- Technology Fractions**
- Mileage Accrual by Class**
- Ambient Temperature by Hour**
- Relative Humidity by Hour**
- Dispensed Fuel RVP**
- Vehicle Population by Class**
- Trips per Vehicle Per Day**
- I/M Program Defaults**

New to EMFAC2002 is the ability to modify the "time at idle" assumptions by vehicle class within the WIS.

(See previous page for details on idle emissions within EMFAC).

UPDATE TO VEHICLE POPULATION

NOTE:

Changes in vehicle population do not affect the estimates of VMT provided by regional transportation planners.

The changes in the inventory associated with changes in vehicle population and registration distribution are due to an increase or decrease in the per vehicle emission (starts, idle and evaporative hydrocarbons), changes to the mileage accrual rates, changes to the age of the fleet, and a shift in population from one vehicle class or fuel type to another.

The vehicle population and registration distribution information (the number of vehicles by age) were last updated in 2000 as an input to the EMFAC2000 model (version 2.02). In preparing EMFAC2002 for release, staff updated these estimates with the latest information available from the California Department of Motor Vehicles (DMV).

Staff used extractions from the 1999, 2000 and 2001 calendar year DMV registration database to determine the population and age distribution of the fleet.

The over 30,000,000 records per year in the initial datasets were screened to eliminate non-operative vehicles, duplicate records, non-qualifying fuel types (anything other than gasoline, diesel or electric), and off-road vehicles including boats, trail bikes, all terrain vehicles, bulldozers and cranes. Finally, all vehicles registered outside of California, either in a different state or country, were discarded. This is a departure from previous practice. Because of the uncertainty regarding whether vehicles that are registered out-of-state or out of country are actually operated in California and where within the state these vehicles may be operated, staff chose to discard these records rather than randomly assign them geographically. The emissions of out-of-state and out-of-country vehicles are handled elsewhere in the model.

The resulting datasets were first subdivided into passenger cars, motorcycles, school buses, transit buses, motor homes, and "other" trucks. The vehicles in the other truck category were then classified by weight class (see table below). To accomplish this task, staff relied on DMV entries of gross vehicle weight (where available). In cases where this information was lacking, staff used manufacturer and model data, or vehicle identification number software (VIN Decoder software). As the name implies, VIN decoder software uses information from the vehicle's identification number to shed light on its characteristics.

In the end, staff lowered the overall vehicle population compared to the projections of EMFAC 2001. The table below presents the results of the current analysis versus the projections from EMFAC 2001 for calendar year 1999. This five percent reduction in the population results in a 71 ton per day reduction in ROG, and a 416 ton per day reduction in CO. NO_x and PM increased by 21 and 0.5 tons per day, respectively, statewide in 2010. This increase is attributable to an increase in the population of diesel-powered vehicles in some categories.

REVISED VEHICLE POPULATION ESTIMATES

1999 Vehicle Population			
Vehicle Class	Weight Class (GVW)	EMFAC2001	EMFAC2002
Passenger Car	All	14,068,400	12,302,560
Light-Duty Truck 1	0 -3,750	2,123,660	3,277,646
Light-Duty Truck 2	3,751-5,750	3,758,850	3,362,701
Medium-Duty Truck	5,751-8,500	1,595,970	1,483,471
Light-Heavy-Duty Truck 1	8,501-10,000	261,618	230,160
Light-Heavy-Duty Truck 2	10,001-14,000	79,379	75,656
Medium-Heavy-Duty Truck	14,001-33,000	255,519	225,792
Heavy-Heavy-Duty Truck	33,001+	168,663	136,695
School Bus	All	28,022	23,559
Transit Bus	All	13,534	25,399
Motor Home	All	150,398	266,205
Motorcycle	All	337,146	380,629
Total		22,841,159	21,790,473

COMPARISON OF EMFAC2001 AND EMFAC2002 (SUMMER-TPD)

Year 2000	Reactive Organic Gases		Carbon Monoxide		Oxides of Nitrogen		Particulate Matter	
Air Basin	EMFAC2001	EMFAC2002	EMFAC2001	EMFAC2002	EMFAC2001	EMFAC2002	EMFAC2001	EMFAC2002
Great Basin	2.7	2.3	24.4	21.3	3.1	3.2	0.07	0.07
Lake County	4.8	3.9	42.5	35.8	4.4	4.2	0.10	0.09
Lake Tahoe	3.2	2.4	34.1	26.4	2.6	2.6	0.07	0.06
Mojave Desert	31.2	29.1	343.3	342.0	39.0	45.7	1.26	1.18
Mountain Counties	27.0	23.0	232.1	200.7	27.9	27.6	0.75	0.70
North Central	29.5	26.1	297.7	269.4	46.1	48.8	1.31	1.25
North Coast	23.0	19.0	207.9	179.0	30.4	29.8	0.76	0.72
Northeast Plateau	7.5	6.2	67.5	58.9	7.4	7.5	0.19	0.18
Sacramento Valley	98.9	82.0	943.0	787.1	143.1	137.6	4.21	3.74
Salton Sea	22.6	19.2	254.9	219.8	30.4	32.9	1.02	0.92
San Diego	99.4	86.4	1,039.2	923.4	145.4	145.5	4.67	4.26
San Francisco	225.0	194.9	2,141.9	1,922.0	335.7	339.2	9.93	9.38
San Joaquin	138.2	115.0	1,456.4	1,225.9	229.5	223.6	6.72	6.11
South Central	51.4	43.0	479.8	413.8	67.1	68.5	1.88	1.66
South Coast	454.5	392.2	4,522.9	4,032.3	637.9	680.4	20.07	17.8
Total	1,218.9	1,044.7	12,087.6	10,657.8	1,750.0	1,797.1	53.01	48.12

Year 2010	Reactive Organic Gases		Carbon Monoxide		Oxides of Nitrogen		Particulate Matter	
Air Basin	EMFAC2001	EMFAC2002	EMFAC2001	EMFAC2002	EMFAC2001	EMFAC2002	EMFAC2001	EMFAC2002
Great Basin	1.6	1.4	13.2	12.0	2.1	2.3	0.07	0.07
Lake County	3.3	2.6	27.4	22.8	3.2	3.1	0.11	0.11
Lake Tahoe	2.0	1.6	17.6	14.2	1.8	1.7	0.07	0.07
Mojave Desert	17.1	15.1	195.0	183.5	25.1	29.0	1.58	1.58
Mountain Counties	16.5	13.6	130.0	109.0	18.1	17.8	0.88	0.76
North Central	14.4	13.5	146.6	136.7	27.1	30.1	1.39	1.26
North Coast	13.3	11.9	112.1	104.8	19.4	19.9	0.78	0.70
Northeast Plateau	4.4	4.1	37.0	35.3	5.3	5.8	0.21	0.19
Sacramento Valley	48.8	43.5	417.3	379.6	71.8	75.7	4.23	3.67
Salton Sea	11.7	11.7	126.5	122.2	18.9	22.3	1.13	1.02
San Diego	46.7	42.1	465.9	433.1	75.8	81.3	5.09	4.60
San Francisco	115.7	108.8	1,054.1	1,051.8	191.5	210.0	9.96	10.38
San Joaquin	68.1	58.7	672.0	592.0	132.3	137.4	7.45	6.29
South Central	24.6	22.4	204.5	198.7	33.5	38.8	1.98	1.72
South Coast	222.0	187.1	2,064.7	1,800.4	331.8	368.1	21.45	18.10
Total	610.3	538.1	5,684.1	5196.1	957.7	1043.3	56.57	50.52

HEAVY DUTY TRUCK TESTING

As part of our continuing effort to improve the vehicle emissions inventory, ARB is co-sponsoring a multi-phase national study to obtain additional heavy-duty diesel truck chassis test data. This new study adds a four mode test cycle designed to better depict the emissions of heavy-heavy duty diesel trucks under real world conditions, including emissions from engines programmed to go "off-cycle" at certain speeds. Off-cycle programming favors improved fuel economy at the expense of increased emissions. Legal settlements with engine manufacturers prohibit off-cycle emissions beginning with 1999 model year engines.

In Summer 2002, ARB received preliminary data from Phase 1 of this study for 25 trucks, including three model year 2000 vehicles. Initially, these data seemed to indicate that NOx emissions from late-model heavy diesel trucks might be higher than we previously estimated. However, subsequent analysis indicates that further improvements to the speed correction factors for heavy-duty trucks may nearly offset these emissions. Phase 2 of the study will provide additional data and allow for a more defensible analysis.

Therefore, we do not believe it is appropriate to reflect the preliminary study results in the model or air quality and transportation plans. The next step is to complete the truck study. We will incorporate the final study data when we propose the next version of the EMFAC model for public review and comment.

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Our website provides detailed information in the form of technical memoranda on each change to the inventory as well as background material, inventory overviews and programming notes.